

Robotic Autonomous Navigation and Orientation Tracking System, Phase I

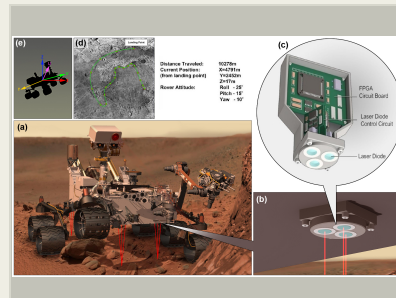
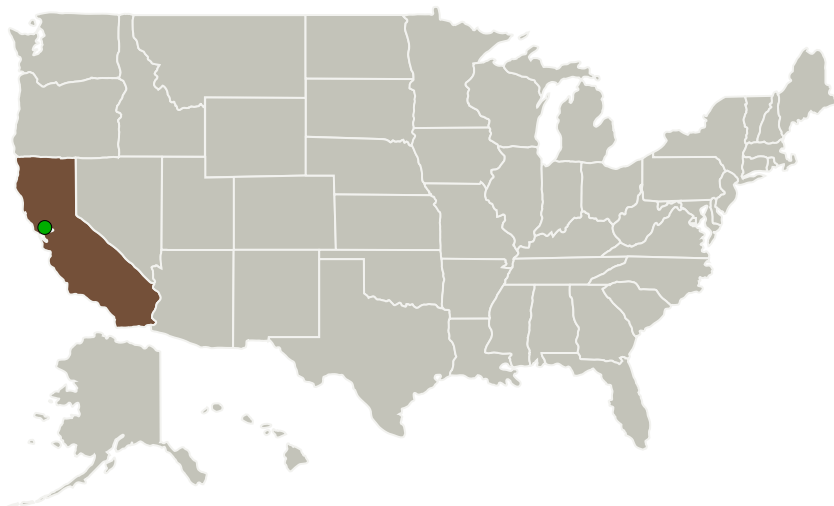
Completed Technology Project (2015 - 2015)



Project Introduction

To address the NASA Johnson Space Center (JSC) needs for improved robotic platform navigation and real-time position and orientation tracking on the infrastructure-free lunar, planetary, or asteroid surfaces, Physical Optics Corporation (POC) proposes to develop a new Robotic Autonomous Navigation and Orientation Tracking System (RANOTS) based on a set of compact and reliable self-mixing interferometers utilizing low power semiconductor laser diodes. This system will supplement currently used vision-based navigation and wheel odometers to improve navigation precision, location awareness, and platform orientation tracking for lunar and Mars Exploration Rovers (MERs), planetary extravehicular activities (EVA), and manned rovers. The RANOTS will offer position accuracy better than 1 m with 95% probability per hour of fast (meters per second) motion without interacting with other positioning systems, and be compact (<10 cu. in.), lightweight (<8 oz), and consume <0.25 W of power. In Phase I, POC will demonstrate the feasibility of the RANOTS by creating and testing a preliminary prototype, which will demonstrate technology readiness level (TRL)-4 by the end of Phase I. In Phase II, POC plans to develop a fully functional prototype and demonstrate its operation on an autonomous vehicle on rough Earth terrain (TRL-6). The RANOTS development will offer NASA the capabilities to provide precise navigation and attitude tracking to support significantly faster moving platforms on lunar or Martian missions, thus enhancing the scientific output of these expensive enterprises.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Physical Optics Corporation	Lead Organization	Industry	Torrance, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations

California

Project Transitions

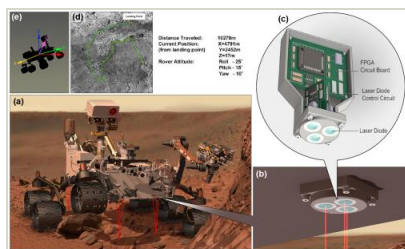
**June 2015:** Project Start**December 2015:** Closed out

Closeout Summary: Robotic Autonomous Navigation and Orientation Tracking System, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139413>)

Images



Briefing Chart Image

Robotic Autonomous Navigation and Orientation Tracking System, Phase I
(<https://techport.nasa.gov/image/133086>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Physical Optics Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

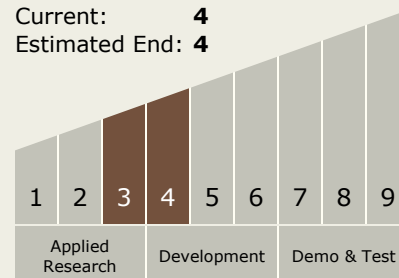
Carlos Torrez

Principal Investigator:

Victor Grubsky

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.1 Sensing and Perception
 - └ TX04.1.2 State Estimation

Target Destinations

Earth, The Moon, Others Inside the Solar System, Outside the Solar System, The Sun, Mars